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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/816,770	03/26/2001	Tsuyoshi Kitahara	Q63724	4825

7590 05/21/2004
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EXAMINER

NGUYEN, LAM S

ART UNIT PAPER NUMBER

2853

DATE MAILED: 05/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	09/816,770		KITAHARA, TSUYOSHI	
	Examiner		Art Unit	
	LAM S NGUYEN		2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12 and 20 is/are allowed.
- 6) ☒ Claim(s) 1-11 and 13-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 July 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-10, 13-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Takahiro et al. (JP 11058704).

Kitahara et al. disclose a method of jetting liquid droplets or a liquid jetting apparatus, comprising:

providing a liquid head (FIG. 1, element 10), including: a plurality of nozzle orifices (FIG. 3, element 22A, and column 6, line 19-22); a plurality of pressure generation chambers associated with the nozzle orifices (FIG. 3, element 27, and column 7, line 38-39); and a plurality of piezoelectric vibrators for respectively varying the volume of the associated pressure generation chamber to jet a liquid droplet from the associated nozzle orifice (FIG. 3, element 17);

Kitahara et al. do not disclose the providing ID data provides the ID data for identifying the respective nozzle orifices.

However, Barbehenn et al. disclose ID data storage provides the ID data for identifying the respective nozzle orifices (column 3, line 43-53).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to include the ID storage (column 3, line 43-53) for providing the ID data of the respective nozzle orifices as disclosed by Barbehenn et al. into the printing apparatus disclosed by Kitahara et al. The motivation of doing so is to increase the capability of controlling the ejecting of proper ink volume, the ink drop velocity, and various other manufacturing tolerances or defects for driving an array of nozzle orifices as taught by Barbehenn et al. (column 2, line 2-8).

In addition, Kitahara et al. and Barbehenn et al. do not disclose the providing a reference drive signal which is applied to the piezoelectric vibrator such that a reference liquid droplet having a designated amount is jetted from the nozzle orifice, applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices; measuring amounts of the respective liquid droplets jetted by the reference drive signal, identifying a difference between the designated amount and the measured amount of each liquid droplet; providing correction data for reducing the difference, associating the correction data with the respective nozzle orifices identified by the ID data, storing the associated correction data, providing a plurality of drive signals for driving the piezoelectric vibrators to jet liquid droplets from the nozzles, selecting at least one drive signal from the plurality of drive signals to adjust a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice, based on the associated correction data when the identified nozzle orifice receives print data **(Referring to claims 13-19)**, and applying the selected drive signal to the piezoelectric vibrators, wherein the at least one drive signal within a single jetting cycle of the jetting head is selected in

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the selecting step and wherein the plurality of drive signals respectively have different liquid jetting energy from each other (**Referring to claim 2**).

Takahiro et al. disclose a process used in an image forming apparatus comprising the steps of providing a reference drive signal to instruct the piezoelectric vibrator to jet a reference liquid droplet having a designated amount from the nozzle orifice (paragraph [0023]: a corresponding drive waveform is given to each ink discharge means to discharge an ink quantity that is setup beforehand), applying the reference drive signal to the respective piezoelectric vibrators to jet liquid droplet from the nozzle orifices, measuring amounts of the respective liquid droplets jetted by the reference drive signal (paragraph [0023]: the drive waveform is applied to the ink discharge means 1-1 to 1-N and the amount of ink ejected out from each nozzle is measured); identifying a difference between the designated amount and the measured amount of each liquid droplet (paragraph [0023]: comparing the reference value of the ink discharge quantity set up beforehand to the measured ink discharge value), providing correction data for reducing the difference so that the designated amount is jetted from the nozzle orifice (paragraph [0023]: an error with the amount of ink ejected from each nozzle is computed and the variation amendment is adjusted so the desired amount of ink is ejected from each nozzle), associating the correction data with the respective nozzle orifices identified by the ID data (paragraph [0023]: the amount of ink ejected is measured and used to compute the error for each nozzle), storing the associated correction data (paragraph [0023]: the variation amendment table is adjusted), providing a plurality of drive signals for driving the piezoelectric vibrators to jet liquid droplets from the nozzles (FIG. 3, waveforms 1-M), selecting at least one drive signal from the plurality of drive signals to adjust a displacement behavior of a piezoelectric vibrator

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associated with the identified nozzle orifice, based on the associated correction data when the identified nozzle orifice receives print data, and applying the selected drive signal to the piezoelectric vibrators (Abstract and FIG. 1: the selectors 3-1 to 3-N, based on the correction data of the ink discharge amount, select a voltage waveform from a plurality of waveforms generated by the generators 2-1 to 2-N to control the liquid ejection of the discharge elements 1-1 to 1-N), wherein the at least one drive signal within a single jetting cycle of the jetting head is selected in the selecting step and wherein the plurality of drive signals respectively have different liquid jetting energy from each other (FIG. 3: Each waveform 1-N has different jetting energy and is a single waveform in a jetting cycle to cause an ejection of a droplet having an amount different from the others).

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to modify the process used in the jetting liquid droplets apparatus disclosed by Kitahara et al. in view of Barbehenn et al. such that including the steps of providing the reference drive signal to the actuator to jet a designated amount of liquid, measuring amounts of the jetted liquid droplets, identifying a difference between the designated amount and the measured amount of each liquid droplet, providing correction data for reducing the difference, and adjusting a displacement behavior of the piezoelectric vibrator based on the corrected data as disclosed by Takahiro et al. into The motivation of doing so is to control the variation in the ink discharge quantity from each nozzle in order to obtain a record image without concentration unevenness or banding as taught by Takahiro et al. (paragraph [0024]).

Kitahara et al. also disclose the following claimed invention:

Referring to claims 3, 6, 8:

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comprising at least one drive signal generator (FIG. 1, element 8), for generating N drive signals (FIG. 9: Four selected signals), respectively driving the piezoelectric vibrators, within a single jetting cycle (FIG. 9: in term of "print period") (FIG. 4) of the liquid jetting head, N being an integer which is not less than 3 (FIG. 9: $N = 4$);

comprising a drive signal supplier (FIG. 1, element 16) for selecting at least one drive signals or M drive signals (FIG. 9: $M =$ one or at least two) from the plural or N drive signals to adjust a displacement behavior of a piezoelectric vibrator associated with the identified nozzle orifice (FIG. 9: each selected signal adjusts the amount of ink ejected), wherein M being an integer which is equal to or less than N (FIG. 9, $M = 1$ or $2 < N = 4$);

applying the M drive signals to the piezoelectric vibrators within the single jetting cycle (FIG. 9);

Referring to claims 4, 9: wherein the selected drive signals are applied at different intervals within the single jetting cycle (FIG. 9)

Referring to claims 5, 10: wherein the intervals are determined such that a phase of residual vibration of a meniscus of the liquid in the nozzle orifice is adjusted due to jetting by a preceding drive signal (FIG. 4-7, and column 10, line 20-35).

Referring to claim 7: wherein the drive signal supplier selects at least two drive signals from the plural drive signals (FIG. 9).

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kitahara et al. (EP0827838) in view of Barbehenn et al. (U.S. 5363134) and Takahiro et al. (JP 11058704) as applied to claim 8, and further in view of Bain (U.S. 4521786).

Kitahara et al., as modified, disclose the claimed invention as discussed above, except wherein a plurality of drive signal generators are provided such that different drive signals are generated from the respective drive signal generator.

However, Bain discloses a printing system including a plurality of drive signal generators (in term of "programmable driver/control (PDC)") (FIG. 4 and FIG. 5, element 113) are provided such that different drive signals are generated from the respective drive signal generator.

Therefore, it would have been obvious for one having ordinary skill in the art at the time the invention was made to replace the drive signal generator in the liquid ejecting apparatus disclosed by Kitahara et al., as modified, by the plurality of drive signal generator for providing different drive signals as disclosed by Bain. The motivation of doing so is to be able to separately program the parameters such as velocity and volume of a droplet at each drive signal generator for each different nozzle orifice in order to obtain optimal operation of the printhead as taught by Bain (column 1, line 46-61).

Allowable Subject Matter

3. Claims 12 and 20 are allowed.

The most pertinent prior art fails to disclose wherein volume differences among the liquid droplets ejected by the respective drive signals can be divided by a volume of a liquid droplet which is the minimum volume jetted by one single drive signal. Therefore, the claimed invention is not disclosed by the cited prior arts.

Response to Arguments

Applicant's arguments filed 05/03/2004 have been fully considered but they are not persuasive.

Regarding to the argument of page 14: The applicants argued that Takahiro fails to disclose at least one drive signal selected from among a plurality of drive signals based on the alleged correction data. However, as discussed above, as shown in Abstract and FIG. 1, Takahiro teaches that the selectors 3-1 to 3-N, based on the correction data of the ink discharge amount, select a voltage waveform from a plurality of waveforms generated by the generators 2-1 to 2-N to control the liquid ejection of the discharge elements 1-1 to 1-N. Therefore, the argument is not persuasive.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN
May 18, 2004

Hai Pham
HAI PHAM
PRIMARY EXAMINER